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Experts' view on Finland's energy policy

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ABSTRACT

By international standards Finland's per capita emissions of carbon dioxide are fairly high. This study gives an outline of Finland's current energy policy, the threats and opportunities in the energy sector, and future scenarios in terms of energy production, use of nuclear power and the Finnish way of life. The aim of this study was to examine Finnish energy policy by means of a qualitative interview survey of selected energy sector experts. The results of the study indicate a lack of coherence in Finland's present energy policy. Economic uncertainties show up as the most significant threats affecting the energy sector. The most significant opportunities for Finland focus on the prospects for international exports of products, services and expertise based on Finnish energy efficiency and energy savings. Unanimity was expressed on the future direction of energy production in Finland, namely that it should focus on the development of renewable energy sources and the diversification of production technologies, although there were conflicting views among the experts interviewed regarding the use of nuclear power. In regard to the Finnish way of life, the most significant changes anticipated are under the themes of travel, housing, leisure and energy attitudes.

Contents

1. Introduction

Climate change is a very serious problem. Indeed, in practical terms, there is no longer any chance of preventing climate change from occurring. Even if all emissions were to stop immediately, the climate would, it is predicted, grow warmer by at least 1.5 °C. Energy production is overwhelmingly the largest source of emissions into the atmosphere, and the world's total energy consumption is rising constantly.

Greenhouse gases (GHGs) emitted into the atmosphere cause global temperature to rise, thus leading to a hazardous phenomenon known as climate change [1]. Now, there is an urgent need to take measures toward reducing greenhouse gases and adapting

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to the consequences of climate change (e.g., [2–4]). Human societies live in an environment whose care and management are everyone's shared social responsibility (e.g., [5,6]). The international and political issues surrounding climate change control are now focused on the energy sector [7,8]. Given the urgency of the situation, efforts are being made to find new ways of achieving ever higher levels of environmental protection [9].

The level of emissions produced over the coming decade will be decisive. Some well known estimates show that emissions from the energy industry will rise by 45 per cent in the period to 2030 [10]. Meinshousen et al. [11] choose a whole class of scenarios from other models that they build their analysis on. They conclude that if emissions stay at current levels, the remaining room for manoeuvre will already be used up in 20 years. However, if emissions continue to grow at the rate seen in recent years, the remaining amount of 'permissible emissions' would be used up a lot sooner—by about 2022, in the case of carbon dioxide. The environment strategy drawn up already by the OECD refers to climate and energy issues as being among the 'red light' environmental concerns and thus representing a very urgent situation prevailing worldwide [12]. The unavoidable need to introduce significant improvements in energy efficiency is clearly a political question facing governments everywhere [13].

By international standards, Finland's per capita emissions of carbon dioxide are fairly high. In 2003–2005 the average annual emissions were 12.7 t of CO_2 per capita, as against the 9.0 t of CO_2 per capita for all the EU-25 countries [14]. Finland's poor performance in the comparison can be explained by the fact that it has a northern European climate, it is sparsely populated (17 inhabitants per sq. km) and its industries are energy intensive. This means that considerable energy is used in the heating of homes and other buildings and in travelling long distances.

Finland is involved in negotiations on climate and energy issues as a member of the European Union. Finland's new Long-Term Climate and Energy Strategy, completed in late 2008, sets out detailed measures for 2020 and outline measures for the period to 2050 [15]. The new strategy recognises that implementation of the required measures will mean changes in the way we live, think and behave and in our values [16]. If national strategies are to achieve real results, they need to be accompanied by regional and local programmes and an active approach [17]. Concern over climate issues is growing continuously in Finland at the decision-making level: in an opinion survey aimed at the Finnish Business and Policy Forum (EVA), 80 per cent of the respondents regarded climate change as the greatest problem of our time [18]. Global warming is also the biggest issue of concern for Finland's municipal decision-makers [19].

Finland's energy system has traditionally been based on strong state control and regulation [17]. Since 2000, however, the ownership arrangements for the different types of company and also their roles in the energy sector have changed and become less clearly differentiated. A number of foreign energy companies have also entered the Finnish energy market [20].

Finland is part of the European Union and follows International climate policy. The climate and energy policy objectives and measures agreed the EU guide very much the national preparation and implementation. The EU's objective is to reduce greenhouse gas emissions by at least 20 per cent below 1990 levels by 2020 and to increase the share of renewable energy on average, 20 per cent of final consumption. Defined target for Finland is also to have renewable energy in final energy consumption, 38 per cent in 2020.

Climate change issues have become an integral part of the business activities of Finnish energy companies [21]. In recent times, companies in the energy sector have had to face challenges in managing their energy balance and in satisfying consumer needs comprehensively [22]. In Finland, people believe their own individual consumer choices can be extremely significant for making a difference in the energy sector; this is one of the conclusions from the extensive energy surveys [17], which included a 2007 study based on a random sample ($N=4000$) representing 18–75-year-old Finns. The changeover to environmentally friendly energy solutions is inextricably linked to the attitudes of decision-makers [23]. Good experience has been gained in Finland with voluntary agreements in which energy sector operators have committed themselves to the development of a sustainable energy sector [24].

When armed with the right information, it is easier for a company to give priority to new energy production alternatives over existing systems [25]. The adoption of a more environmentally responsible approach by Finnish energy-sector operators and their support for action to control climate change has led to the desire to demonstrate the improvements to outsiders as well [26]. In addition to recognition by consumers, the importance of the environmentally ethical viewpoint is also recognised by shareholders, governments, employees and interest groups, for example. In the future, the dynamic nature of corporate ethics will mean that companies which are socially responsible and bear their responsibility for controlling climate change will be in an advantageous position on the market [27].

2. Research methodology

2.1. Interview questions

The study aims to assess the current state and future of Finland's energy sector with the help of those working in the

Table 1
Experts interviewed for the study.

Role	Group 1 **Green values (environment)** **Nature-centric attitude**	Group 2 **Efficiency values (business and industry)** **Anthropocentric and techno-centric attitude**
Lobbyist	**A_1**: large, national nature-based interest group. **A_2**: global, effective conservation organisation.	**a**: business and labour market policy interest group representing the electricity and district heating sectors.
Government	**B**: ministry responsible for parliamentary debate on energy and for formulation of future environmental and housing policy. Aim is eco-efficiency in society and prevention of adverse changes in the atmosphere.	**b**: ministry responsible for Finland's entrepreneurship and innovation, the functioning of labour markets and workers' employability, and development of the regions in a global economy. Remit includes formulation of energy and climate policies and implementation of national coordination.
Media	**C**: independent news and current affairs magazine based on green values and good journalistic criteria.	**c**: Finland's leading business media reporting, commenting on and analysing economic events, news, background and so on.
Free thinker	**x**: an independent public foundation that promotes wellbeing and prosperity in Finnish society and is subject to parliamentary control.	

sector. Eight Finnish energy experts were interviewed in the study. The interviewees were all well versed in energy and climate issues. The study offers a new approach to understanding Finnish energy policy public by documenting the views of a selection of the country's energy sector experts as individuals.

The interview questions concerned the following: (i) current state of Finnish energy sector, (ii) issues affecting Finland's energy sector and (iii) future prospects for Finnish energy sector. In qualitative studies, the aim is to describe particular events, understand certain actions or provide a theoretically meaningful interpretation of observed phenomena [28]. This approach enables a more detailed and profound analysis of the phenomenon in question, in contrast to quantitative research, which commonly restricts itself to confirming the existence of the phenomenon. Qualitative research discovers and reveals new information rather than verifying existing statements [29].

For this study a qualitative case method was considered appropriate, since the aim was to consider, investigate and discuss Finnish energy policy using new approaches to the subject. Eight Finnish experts whose work involves consideration of energy issues were selected to present their personal views on attitudes in Finnish society in general towards energy issues. All eight experts had worked for a long time energy issues, in the different points of view and were selected because they definitely had to-date information of the topics. These experts' views cannot, of course, be taken as representative of society as a whole but instead seek to define or expand on different aspects of Finnish attitudes to energy issues.

2.2. *Subjects of the research and the data collection method*

Energy goals and responsibilities are increasingly being allocated and coordinated in new ways and through a variety of cooperation channels [30,31]. These networks are interactive and operate at the governmental level (politicians, authorities), collectively (interest groups) and on the markets (companies) [32,33].

A similar division was used in this study, with the interviewed experts being divided into four categories, including an independent 'free thinker'. Table 1 presents the interviewed experts in terms of their environmental attitude (Group 1 and Group 2) and their role (lobbyist, government, media and free thinker). This same division was also used in a study on future scenarios for Finland's energy policy [8].

A decision first had to be made about the number of study participants. It was decided to select a small number of highly relevant participants working in the Finnish energy sector. The motivation, why the selection of eight interviewees were chosen, was made so as to ensure representation from all the different parts of the energy sector, which would also ensure that any differences in goals and values would be covered. The expectation in the sampling was to obtain the views of as wide a variety of experts in the energy sector as possible.

The number of organisations in each of the seven categories above, and the number of experts working in each organisation, was first assessed. There were many possible organisations to represent lobbyist groups, media groups and free thinkers, but on the government side there were only the two ministries in question. Within the ministries the experts were randomly selected from the heads of the ministries.

The free thinker selected works for a public foundation which has an explicit agenda. Nevertheless, he was still presented as a free thinker in this study because his work in the energy sector differs significantly from that of other experts, and the main aim of his organisation is to promote prosperity under Government guidance and control in a manner that aims to address the concerns of everybody.

2.3. *Research and analysis*

The duration of the interviews ranged from 60 to 120 min. Each interview was recorded. In each interview there was one interviewee and one interviewer (one of this article's two authors). Qualitative data analysis software called ATLAS.ti was used as an analysis tool. The study data was analysed using data-based content analysis. This separates out the themes that are brought up recurrently by the study participants [34]. This process was guided not by previous information or observations but only by the research questions themselves and the overarching purpose of producing some understanding of the energy sector, a different approach to understanding Finnish energy policy public. The data was analysed by dividing it into ever smaller components for interpretation. This allowed the most important subjects to be clearly emphasised. This detailed analysis phase improves the assessability and reliability of the qualitative data [35].

This method of analysis does not attempt to make inferences about Finnish society at large on the basis of evidence assembled from interviews. However, while the data cannot be said to directly reflect the Finnish energy policy, the views seek to define or expand on different aspects of it.

3. Results

3.1. *Present Finnish energy policy*

The present status of Finnish energy policy can be described using a four-field table (Fig. 1). The horizontal axis indicates whether the Finnish energy sector and its operations are viewed positively or negatively. The vertical axis indicates how the operating environment for Finnish energy policy is perceived. On the negative side of the vertical axis (passive), the energy sector and its operations are viewed as being inflexible and slow to change, while on the positive side (proactive), the energy sector and its operations are seen as being well-organised and fast acting.

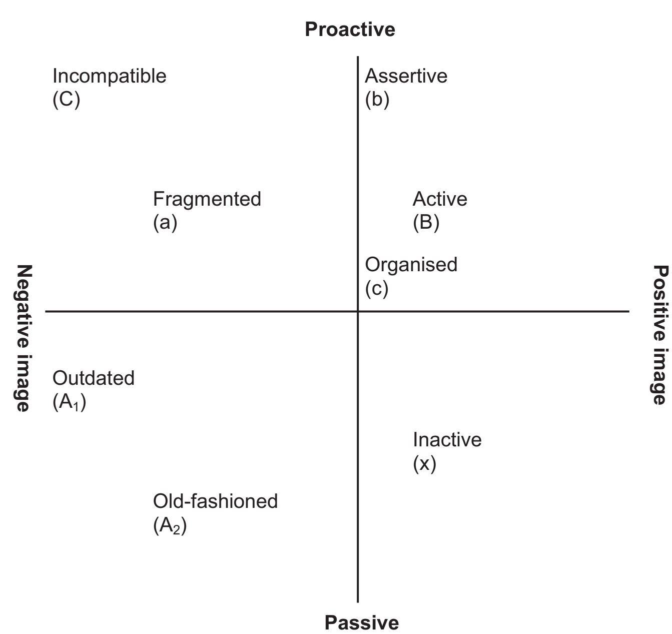


Fig. 1. Perceptions of Finnish energy policy.

The experts interviewed in the survey gave the following justifications for their views (Fig. 1). The terms used in Fig. 1 are explained shortly below:

- Incompatible: party divisions, conflicts in perceptions, needs of industry.
- Fragmented: incoherence, no common goals.
- Assertive: climate change agreements, specific objectives.
- Active: link to climate policy, effective measures.
- Organised: clear strategies.
- Outdated: heavy engineering/metal industry, procrastination in action.
- Old-fashioned: lacking courage, old technologies, insufficient tools.
- Inactive: common understanding but no means, ambivalent situation.

Based on the views presented by the experts interviewed in the survey, Finland's energy policy appears rather confused. Only one interviewee, B, felt that Finland's current energy policy is both positive and proactive.

Table 2 presents a comment from each interviewee concerning the perception of Finland's energy policy.

3.2. Threats and opportunities

The main threats affecting Finland's energy sector, as presented by the experts interviewed, can be placed under five headings: technological, economic, global, temporal and human. These categories and the most significant perceived threats are given in Table 3.

Measures perceived as opportunities for Finland's energy policy can be divided into two categories: domestic (A_1 and C) and international (A_2, B, a, b, c and x). Below are comments by the interviewees on the subject:

– More effective energy savings can be made domestically. (A_1)

Table 2
Selection of interviewed experts' comments on Finnish energy policy.

Overall view	Expert	Theme	Comment
Negative image; passive	A_1	Outdated	Very negative image. Unnecessary stalling in development of new energy resources. Overall, outdated and poorly organised. Based on the needs of heavy industry.
	A_2	Old-fashioned	Desire to stick to old technologies. Not the courage to make the necessary reforms. Not managed to introduce the necessary mechanisms for increasing the production role of more sustainable technologies.
Negative image; proactive	C	Incompatible	Listening to industry's demands, despite different goals. Hung up on the idea that Finland will not survive without cheap electricity. Extreme scenarios, but action outdated.
	a	Fragmented	Business and other stakeholders lack a common vision.
Positive image; passive	x	Inactive	Energy policy debate split in two: the nuclear debate is focusing on how much more energy Finland will need, whereas the climate debate is aimed at reducing energy consumption. Long-term goals are accepted, but ways to make progress cannot be found.
Positive image; proactive	b	Assertive	Specific EU climate targets have to be achieved by 2020. Different visions and Finland's energy report point the way to 2050, show the seriousness of the situation and the need for structural change.
	B	Active	Energy policy is dictated by Finnish climate policy, and vice versa. Trying hard to respond to the challenges of climate change policy. Ministries are active.
	c	Organised	Finland's climate policy strategy dictates energy policy. In the background is the EU climate and energy policy. Climate negotiations, defined objectives.

Table 3
Main threats affecting the Finnish energy sector, according to eight Finnish experts.

Threat category		Main threats
Technological	**C**, $\mathbf{A_2}$	Construction of a new nuclear plant, including repository, security and waste treatment. Development of renewable energy sources slows down because of investment in nuclear technology. Nuclear power plant satisfies the electricity market, slowing the development of new technologies.
Economic	$\mathbf{A_2}$, **a**, **b**, **c**	People do not want to pay more for electricity, so renewable energy is not widely available. Energy price rises in the coming years. Changing the industrial structure involves significant costs. Society's ability to pay; changes need investment and structural change is uncertain. National economy affected in many ways, direction uncertain. Energy companies move abroad. Difficulty determining price of electricity, its production and use regulated. Finland may miss out on international developments.
Global	$\mathbf{A_1}$, **c**	Finland becomes exporter of nuclear power; internal energy reform neglected. Focus on exports, with domestic energy saving and efficiency in second place. Transfer of production elsewhere leads to threat of growing domestic unemployment.
Temporal	**B**, **x**, **b**, $\mathbf{A_2}$	Energy supply structure will change slowly, and not enough time to reduce greenhouse gas emissions sufficiently. Finland does not have time for research development; Denmark and the United States are investing a lot already. Old ways adhered to, but these do more harm in the long run than currently believed. Too much debate in Finland; still using fossil fuels and trailing behind in worldwide developments. Finland is already behind as concrete changes to energy production have not been made.
Human	**a**	Energy company personnel have a high age profile (average age 42, more than 40 per cent over 50 years old). Finding new staff is a challenge. 'Yes–no' debate prolonged, does not lead to successful and viable solutions. Energy sector's poor reputation worsening, and talks with stakeholders and policy-makers no longer taken seriously. Conflicts in society, difficulty in introducing wide-reaching reforms that will work well.

- Development of domestic bio-energy, CCS (carbon capture and storage) technology, wind and wave power resources. (C)
- Development and export of expertise in renewable energy, energy conservation and wind power. (A_2)
- Can bring new energy technologies, wind power and renewable fuels and the use of technology to major markets worldwide. (B)
- Finland is known for its combined heat and power (CHP), and this expertise could be exported; the same applies to bio-energy and renewable energy expertise. (a)
- Opportunities for exporting in the technology industry and consultancy. (b)
- Exploit new kinds of technologies, new types of energy sources. Get them established in Finland first and then create new kinds of jobs within the EU. (c)
- Can be among the world leaders in energy efficiency. (x)

The opportunities emphasised by the interviewees referred particularly to international markets and the potential for Finland to export products, services and expertise in energy conservation and improved energy efficiency. The perceived opportunities domestically focused on improving energy efficiency and introducing new technologies for renewable energy sources (interviewees A_1 and C).

3.3. *Future scenarios*

The experts interviewed presented their assessments of the future for each of the following: Changes in energy consumption per capita, energy production, use of nuclear power and Finnish way of life.

3.3.1. *Changes in energy consumption and emissions per capita*

The experts interviewed in the survey gave their assessments of the future scenario regarding changes in average energy consumption and emissions per capita in Finland, focusing on three particular years: 2020, 2030 and 2050.

All of the experts who presented their views on changes in energy consumption (interviewees A_1, A_2, a, B, C and x) felt that this would fall substantially over the next 40 years. There was, however, considerable variation in the views presented: interviewee C felt that average energy consumption per capita would fall by 80 per cent in the period to 2050, whereas interviewee **x** gave a more moderate forecast of only a 30 per cent reduction. The views of the other experts varied between these two extremes.

All of the experts who gave an assessment of the change in emissions per capita in Finland over the coming 40 years (interviewees A_1, A_2, a, c, C and x) felt that there will be a substantial drop in emissions. However, there was considerable variation in these views, too: interviewee A_1 forecast a drop of 95 per cent in average emissions per capita by 2050, whereas interviewee **c** presented a more moderate figure of only a 55 per cent drop. The views of the other experts were between these two extremes.

Some of the experts interviewed were of the opinion that energy production will become almost free of emissions in the coming years, thus obviating the need for radical cuts in per capita energy use and corresponding shifts in consumer habits (interviewees C and a). By contrast, some of the interviewees predicted a clear drop in per capita energy consumption, making it possible to achieve international requirements for emissions reduction (interviewees b and c). Interviewee c also stressed that people would have to change their behaviour in regard to energy use because of the demographic changes taking place and the increasing number of single-person households in Finland. Moreover, assessments of changes in per capita energy consumption and emissions can be misleading, as Finnish industry uses about half of all the energy produced. Forecasts need to be drawn up for households, taking the demographic changes into account.

Among the other interviewees a strongly differing view was presented by interviewee x, who believed that per capita energy consumption in Finland would continue to rise slightly and then return to the present level in around ten years' time. Interviewee b, on the other hand, felt that Finland's per capita energy consumption and emissions would fall significantly over the coming 10 years. The interviewee based this view on the idea that the service industry's final energy consumption will have to be urgently reduced and will thus be reflected immediately in household consumption. A considerable reduction in the emissions from production in the energy sector and the process industry would also be possible if the technologies currently in use were replaced.

3.3.2. *Energy production*

The views of those interviewed in the study concerning the future of energy production were unanimous. The development of renewable energy sources and the active, efficient introduction of these were seen as strengths for the future. In particular, bio-technology use, energy-production methods based on wood, carbon capture and storage (CCS) and wind, water and solar power were all perceived as the most significant factors in Finland's future energy production.

The interviewees considered the diversity of Finland's energy production to be strength. Further diversity was seen as an advantage, allowing the country to build its energy production within the desired parameters. According to the interviewees the advantages of distributed energy production systems should be more actively exploited in the future.

Interviewee A_2 also felt that small-scale energy production would be a very significant addition to overall energy production. Interviewee a emphasised the importance of centralised heating systems in energy production. Interviewee b stressed that new energy production forms must be created alongside the existing situation. Rising energy prices must be taken into account and efforts made to avoid setting unrealistic targets.

3.3.3. *Use of nuclear power*

Among the persons interviewed there was no unanimity on the use of nuclear power and regarding the possible construction of additional nuclear power facilities. The interviewees were all of the same view only in regard to the key issue that Finland should urgently establish a clear position and objectives concerning the future approach to nuclear power.

Below are comments by the interviewees concerning the use of nuclear power as an energy source in the future:

- Unhappy, as no more nuclear power should be allowed. It will prevent the development of any other resources. We should renounce nuclear power completely by the year 2040. (A_1)
- Nuclear power will still be used in 2050 and beyond. (B)
- The view that nuclear power is the only possibility for the future is old-fashioned. We first need an expansion, but we must abandon it completely by 2050. (C)
- The nuclear debate should give rise to a clear, unanimous view, and not just keep shunting the subject around. (b)
- Shows a dichotomy in Finland's energy policy: on the one hand, let us think about how many more nuclear power plants we need, and on the other, let us discuss climate issues and energy conservation. The motives here are pulling in different directions. By 2050 nuclear power will account for about 10 per cent of the total. (x)

Table 4
Impact of energy-sector changes in transforming the Finnish way of life, according to eight experts.

Expert	Theme				
	Travel	Housing	Leisure	Energy attitudes	Other
A_1	Need for travel is reduced, cycling increases, electric cars become more popular.	Village-style living increases, energy efficiency of buildings improves, ‘eco teams’ formed in housing communities.	Focus shifts from consumption to communal sharing, organised solidarity.	Respect for the environment and nature-based hobbies increase.	Shorter working day, more active participation in civic life, 2030 marks largest breakthrough in energy matters.
A_2	Need for travel is reduced, cycling increases, quality of public transport improves.	Low-density housing minimised, increase in low-energy housing, new housing smaller, improved energy-efficiency in renovation.	Leisure time increases and is appreciated more, non-material consumption increases.	Radical change in attitudes, less interest in material things and more appreciation of spending time with others.	Telecommuting increases, decrease in overtime.
B	Need for travel and use of personal car are reduced, changes in vehicle stock, transfer to public transport.	Low-energy houses become popular.	Does not affect free time, but people think more carefully about holiday arrangements.	Concerns about energy issues still rising, attitudes become more positive.	Increasing concern about climate issues, problem becomes critical globally.
C	Railway services are improved and their popularity grows, electric cars become more popular, increase in holidays taken locally.	Increase in passive energy housing, less electric heating.	Increase in locally based holidays.	Media has great power; major media power will deal with energy issue in a more comprehensive and diverse manner.	Vegetarianism becomes considerably more popular.
a	Electric cars become more popular, costs of travel increase, air travel is reduced, popularity of cycling increases.	Stronger trend towards centralisation, housing moves to urban areas.	People work less.	“Downshifting” phenomenon (outward modesty and inner richness) increases value of non-material things, increase in critical views.	Energy prices increase, opportunities for telecommuting increase.
b	Remodelling of all forms of travel.	No dramatic worsening in housing conditions, but instead various changes e.g. air and heat pumps.	Structures change, but the way of life remains unchanged.	Attitudes have constant impact on consumption habits in desired manner.	Radical change in the structure of society by 2050.
c	People make sensible travel choices.	Housing denser, but increase in one-person households, so efficiency undermined, urbanisation continues.	Increased knowledge and awareness of climate change, and this affects people’s decisions.	Growing motivation to think about own energy use.	Number of elderly people increase, possibly a more service-based society.
x	Car use is reduced significantly, work trips by public transport.	Higher density housing, cities grow, local centres in rural areas become popular.	Ground-breaking practices and activities that are now regarded as odd will become normal.	Becomes obvious that everyone has to make energy savings, major shift in attitudes.	More efficient energy use in every field, innovations, increase in use of cleaner forms of energy, telecommuting increases.

3.3.4. Finnish way of life

The study interviewees set out their views concerning the future structure of Finnish society and the future transformation of the energy sector. It was felt that the greatest change in people’s behaviour would be in the following four areas: Travel, housing, leisure and energy attitudes.

In addition, the interviewees emphasised that changes would also occur in e.g. working life, eating habits and demographic developments. Table 4 illustrates the interviewees’ views concerning changes in the Finnish way of life in the period to 2050.

4. Discussion and conclusions

The study was based on the premise that, due to the nature of their work, the energy sector experts would have an understanding of energy policy in Finland. The purpose of the analysis was to compare the views of the different experts and to identify connections and contradictions. The results reflect not only the opinions of experts but also views that seek to define or expand on different aspects of Finnish energy policy.

The experts interviewed in the study were grouped on the basis of their environmental stance into one of two categories: representatives of organisations focusing on environmental values (Group 1) and representatives of organisations focusing on efficiency values (Group 2). The results indicate that the opinions expressed are not directly in keeping with this categorisation.

The division of the interviewees into four groups based on the areas of work represented by them, i.e. lobbyist, government, media and free thinker, was not directly manifested in the comments obtained from these experts. Factors affecting this may include differences in the interviewees’ commitment to the entity they represent and in their duration of employment and personal factors. On the other hand, studies on the division of responsibilities in energy policy and on the formation of extensive cooperation networks [17,30–33] support the observations made in this study.

The findings of this study indicate that Finnish energy policy appears to be fragmented and inconsistent. Only the representatives of the ministries (interviewees B and b) considered energy policy to be proactive and positive. One of the media representatives (interviewee c) was also of the opinion that the current state of the energy sector can be characterised as being positive and organised. The representatives of interest groups that support environmental values (interviewees A_1 and A_2) saw the current status of Finland’s energy policy in the most negative light. According to these representatives, the Finnish energy sector and the activities it is engaged in are outdated and old-fashioned.

The persons interviewed for the survey highlighted the uncertainties associated with economic threats and the need for foresight. On the other hand, the economic threats were also felt to be the most significant obstacles to the favourable development of energy policy. The matters in this threat category were uncertain, challenging and difficult to predict. One reason for the subject area being quite prominent may be the strong economic downturn prevailing in Finland at the time the interviews were carried out.

In the other threat classes (technological, global and temporal) formed on the basis of the interviewed experts' views, international relations and the slowness of the response to new environmental demands stood out. Just one of the interviewees (interviewee a) emphasised the 'human' threat category, i.e. the wide age distribution and poor reputation of energy companies, and their contradictory position and poor cooperation with other actors in society.

The results of the study indicate that the main opportunities for Finnish energy policy are in international markets, to which the country could export new kinds of competence and expertise in renewable energy production and energy efficiency and conservation. In the domestic market the further development of renewable energy sources such as bio-energy, CCS technology, wind and water power were seen as the strengths with the greatest potential for Finland.

The interviewees felt that Finland's per capita energy consumption and emissions would begin to decline in the coming years, though there was substantial variation in the experts' evaluations. Energy consumption was expected to decrease fairly steadily, amounting to about 5–15 per cent within 10 years. It was estimated that Finland's per capita energy consumption would be as much as 30–80 per cent lower in 2050 than at present. The interviewees also estimated that per capita GHG emissions would decline sharply over the next 40 years, by about 55–95 per cent from the current levels. All the assessments by the interviewees emphasised the fact that climate emissions must decline more rapidly than average energy consumption, and that cleaner energy and even zero-emissions energy are likely to be developed quickly and at a significant scale.

With such huge drop consumption, there would be of course a major impact on the economy and also it might very well have an impact on the priorities of people living and operating in Finland. Although precise figures are difficult to estimate, an approximately 10% reduction in emissions, at minimum, could be achieved by changing wasteful patterns in household energy consumption [36,37].

The results of the survey indicate that opinions on the use of nuclear power in the future are strongly divided among the energy sector experts. The interviewees' views on nuclear power varied from wishing to see it abandoned urgently to foreseeing its use even long after 2050. Only one of the interviewees (interviewee A_1) saw nuclear power as a clear obstacle to the development of other kinds of energy production. The representatives of the ministries (interviewees B and b) emphasised the moderate use of nuclear power long into the future, but stressed the importance of establishing a consensus in the Finnish energy sector as a whole.

The results also indicate that the challenges and problems which emerge when defining the current status of Finnish energy policy are also present in the nuclear power debate, in particular the lack of a context for the discussion and the absence of cooperation.

Indeed, all the interviewees felt that finding common ground quickly is of primary importance in Finland's nuclear power debate. One interviewed expert (interviewee x) described the nuclear power debate as a critical watershed preventing all other development.

With respect to the Finnish way of life, the themes of travel, housing, leisure and energy attitudes all stood out in the survey results as being areas of life in which the greatest changes were expected to occur in the coming years. All interviewees identified transport as an area in which substantial changes are likely to take place even quite soon, affecting almost everyone. Changes taking place in housing will also be substantial and fairly rapid. Teleworking opportunities were highlighted and were justified on the grounds that technology can release people from the need for energy-intensive commuting. Interviewees emphasised that leisure time is likely to increase and that energy issues will become more significant and motivating in leisure activity decisions. They also expected non-material consumption to rise and felt that the prevailing ideology would change from consumption to a focus on spending time together and engaging in non-materialistic activities.

Nearly all interviewees emphasised the need for an abrupt change in attitudes with respect to energy use. Individual consumer choices were expected to be based much more on energy saving, and a shift would occur away from a consumption-based lifestyle to one that emphasises non-material factors. An interesting area for further research would be to look at changes that have already occurred or are taking place in the Finnish way of life and which have been motivated by the increasing concern over energy issues. This could shed light on future development trends.

One of the strengths of this study is its use of a new kind of method for energy sector research, bringing depth to the results analysis. On the other hand, the fairly small number of interviewees can be seen as a weakness of the study. It is also unclear how much the views expressed represented the interviewees' own personal opinions and how much they reflected the views of their respective organisation. Further expanding the sample to include experts from the business world or consumer representatives could be interesting in any follow-up studies. It would also be interesting to analyse the extent to which the messages have struck home among decision-makers, energy sector experts and consumers. This could help in identifying possible practical tools for improving energy efficiency and for more detailed specification of measures to combat climate change.

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